

WHAT IS CLAIMED IS:

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1. An image processing apparatus for embedding predetermined information in image data, comprising:
generation means for generating a mask pattern
5 which has a blue noise characteristic and specifies a target embedding position in an $M \times N$ size; and
embedding means for applying the mask pattern to part of the image data and modulating image data corresponding to the target embedding position to embed
10 the predetermined information.
2. The apparatus according to claim 1, wherein the mask pattern is represented by binary information.
3. The apparatus according to claim 1, wherein in the mask pattern, the target embedding position and a
15 non-target embedding position in the $M \times N$ size are represented by binary information.
4. The apparatus according to claim 1, wherein the modulation is performed by quantizing the image data corresponding to the target embedding position.
- 20 5. The apparatus according to claim 1, wherein said embedding means repeatedly applies the mask pattern to a portion other than the part of the image data and modulates the image data corresponding to the target embedding position to embed the predetermined
25 information.
6. An image processing method of embedding
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predetermined information in image data, comprising:

the generation step of generating a mask pattern which has a blue noise characteristic and specifies a target embedding position in an $M \times N$ size; and

5 the embedding step of applying the mask pattern to part of the image data and modulating image data corresponding to the target embedding position to embed the predetermined information.

7. A computer-readable storage medium which stores
10 an image processing program for embedding predetermined information in image data, the program comprising:

the generation step of generating a mask pattern which has a blue noise characteristic and specifies a target embedding position in an $M \times N$ size; and

15 the embedding step of applying the mask pattern to part of the image data and modulating image data corresponding to the target embedding position to embed the predetermined information.

8. An image processing apparatus for extracting
20 predetermined information from image data in which the information has been embedded, comprising:

generation means for generating a mask pattern which has a blue noise characteristic and specifies a target embedding position in an $M \times N$ size; and

25 extraction means for applying the mask pattern to part of the image data and detecting a modulated state

of image data corresponding to the target embedding position to extract the predetermined information.

9. An image processing method of extracting predetermined information from image data in which the information has been embedded, comprising:

the generation step of generating a mask pattern which has a blue noise characteristic and specifies a target embedding position in an $M \times N$ size; and

- the extraction step of applying the mask pattern to part of the image data and detecting a modulated state of image data corresponding to the target embedding position to extract the predetermined information.

10. A computer-readable storage medium which stores an image processing program for extracting predetermined information from image data in which the information has been embedded, the program comprising:

the generation step of generating a mask pattern which has a blue noise characteristic and specifies a target embedding position in an $M \times N$ size; and

- the extraction step of applying the mask pattern to part of the image data and detecting a modulated state of image data corresponding to the target embedding position to extract the predetermined information.

11. An image processing apparatus comprising:

generation means for binarizing each coefficient of a mask and generating a two-dimensional mask having periodical or pseudo-periodical peaks on a radial frequency domain of resultant binary information;

5 first input means for inputting image data;
second input means for inputting additional information;

means for making each coefficient of the two-dimensional mask correspond to each bit information
10 of the additional information; and

digital watermark embedding means for adding/subtracting the image data on the basis of a positional relationship obtained by assigning the two-dimensional mask onto the image data as a
15 correspondence result, thereby embedding each bit information in the image data.

12. The apparatus according to claim 11, wherein said digital watermark embedding means adds/subtracts a value of a pixel of the image data in accordance with
20 contents of each bit information to embed each bit information in the image data.

13. An image processing method comprising:
the generation step of binarizing each coefficient of a mask and generating a two-dimensional
25 mask having periodical or pseudo-periodical peaks on a radial frequency domain of resultant binary

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information;

the first input step of inputting image data;

the second input step of inputting additional information;

5 the step of making each coefficient of the two-dimensional mask correspond to each bit information of the additional information; and

the digital watermark embedding step of adding/subtracting the image data on the basis of a positional relationship obtained by assigning the two-dimensional mask onto the image data as a correspondence result, thereby embedding each bit information in the image data.

14. A computer-readable storage medium which stores an image processing program comprising:

the generation step of binarizing each coefficient of a mask and generating a two-dimensional mask having periodical or pseudo-periodical peaks on a radial frequency domain of resultant binary

20 information;

the first input step of inputting image data;

the second input step of inputting additional information;

the step of making each coefficient of the two-dimensional mask correspond to each bit information of the additional information; and

the digital watermark embedding step of
adding/subtracting the image data on the basis of a
positional relationship obtained by assigning the
two-dimensional mask onto the image data as a
5 correspondence result, thereby embedding each bit
information in the image data.

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